

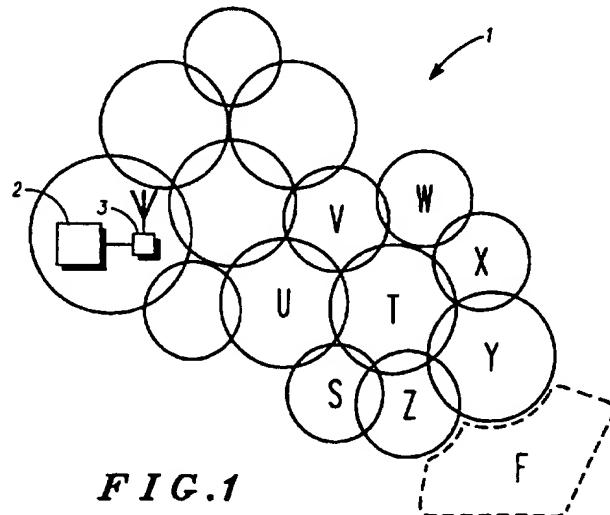
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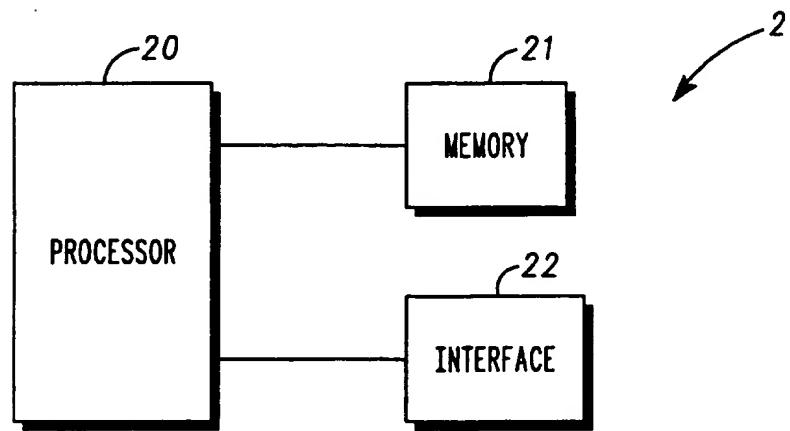
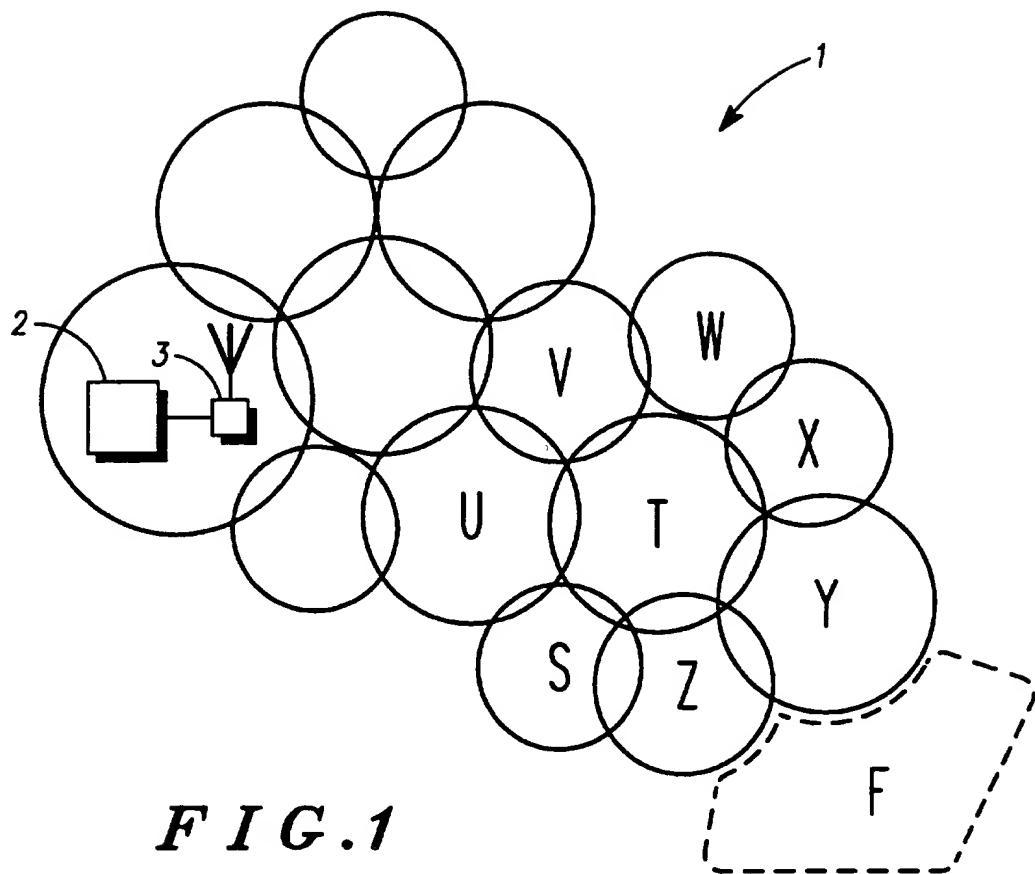
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## (54) A communication control method for use in a radio communication system

(57) The control method provides direct mode and trunk mode operation of radio units including base sites 3 and mobile radios and governs communication in a first geographical area, such as T, by providing a direct mode configuration to be used by at least one of the radio units operating in the first geographical area and downloading the configuration to at least one of the radio units. A configuration to be used by the mobile in a particular geographical area is downloaded to radio units in neighbouring areas S-Z. When a mobile travelling to the particular area passes through a neighbouring area the configuration downloaded thus ensuring that the mobile enters the area with an appropriate configuration. The method may be used where an emergency incident occurs and it is necessary to enable different users groups to communicate in a direct radio mode.



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**FIG. 2**

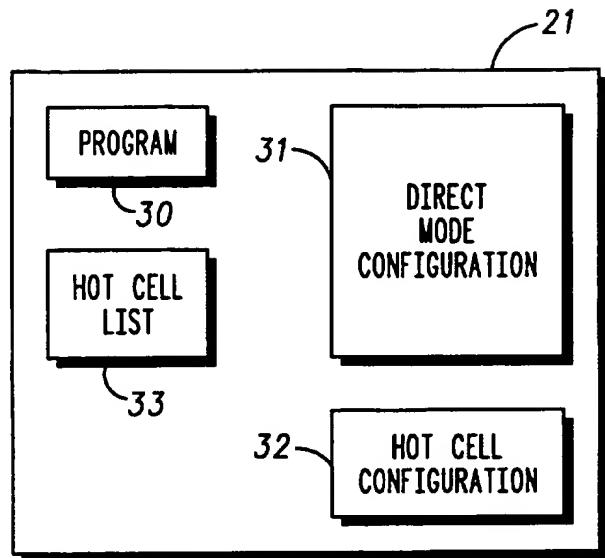


FIG. 3

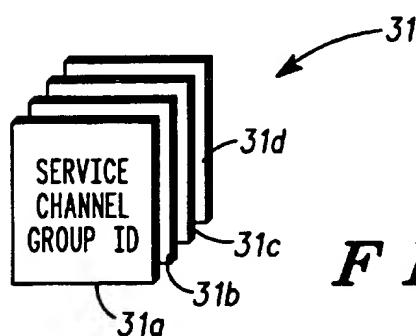


FIG. 4

INCIDENT	CELLS
A	X T S
	Y U
Z	V

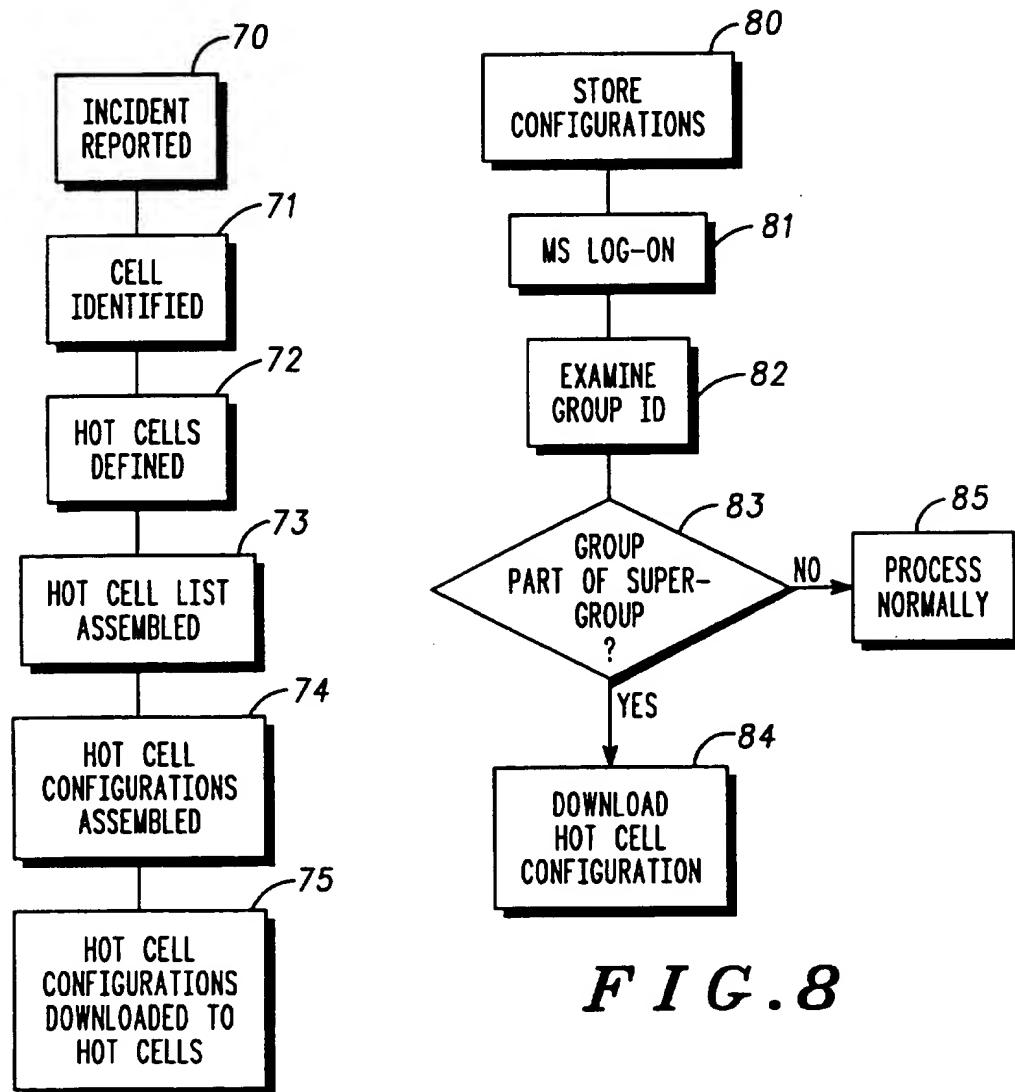
FIG. 5

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32

***FIG. 6***



***FIG. 8***

***FIG. 7***

A COMMUNICATION CONTROL METHOD5 Field of the Invention

This invention relates to a communication control method for use in a radio communication network.

Background of the Invention

10 Modern radio systems typically have the ability to offer two main modes of operation, a trunk mode and direct mode operation. In the trunk mode communication between mobiles is effected by using a base-site as a type of relay. In direct mode both mobiles communicate directly without relying upon a base-site as a relay. Such a system that offers two modes of 15 operation is that proposed in trans-European trunked radio (TETRA).

When operating in direct mode (hereinafter referred to as DMO) the mobile utilises a pre-set or stored set of parameters. The parameters will allocate a call group identifier, frequency channel and perhaps the slots to be used on the channel.

20 The call group identifier is of particular note for this is information which determines the mobiles with which communication may take place. Typical call groups will include Police, Fire and Ambulance Services.

25 The present invention arose from a realisation by the inventor that under certain circumstances it may be desirable for these parameters to be varied. For example, the channel allocated to a particular talk group might be changed in order to more efficiently utilise the available channels. It may be also desirable to allow talk groups to be able to communicate and in a sense an amalgamation of such groups into a single group may be required.

30

Brief Summary of the Invention

According to a first aspect of the invention there is provided a communication control method for use in a radio communication system 35 providing direct mode and trunk mode operation having radio units including base-sites and mobile radios which method governing communication in a first geographical area and comprising the steps of: providing a direct mode configuration to be used by at least one of the radio

units operating in the first geographical area; and downloading the configuration to the at least one of the radio units.

By providing a configuration and downloading the configuration to the mobile, it is possible to change the configuration of the mobile when 5 and as desired. It will be possible to provide different configurations for different geographical areas. For example, different frequencies could be allocated for direct mode operation in different geographical areas permitting the re-use of frequencies in a cellular-like manner.

Preferably, there is included the step of downloading the 10 configuration to at least one of the radio units present in neighbouring geographical areas; and downloading the configuration from the at least one of the radio units to at least one mobile radio such that when the mobile enters the first geographical area it has the appropriate configuration to be used. This is preferable because it will ensure that the 15 mobile has the correct configuration before the configuration is needed for use. Thus, the configuration can be used without delay upon entry into the geographical area.

Preferably, the method includes the step of identifying the first geographical area where a configuration is required.

20 Conveniently, the method includes the step of identifying the neighbouring geographical areas.

The invention provides particular application where the mobile is operable in at least two modes including a trunk mode and a direct mode. The direct mode will be the mode configured to allow direct mode operation 25 when in the first geographical area.

The invention is particularly useful where the configuration is provided for use by a group of radio units. Preferably the method includes the step of allocating radio units to the group. This in effect will create a group for the first area. Typically, the group is formed of sub-groups of 30 radio units. Examples of subgroups could include police, fire and ambulance services and when formed into a combined group they will be able to communicate together.

The invention is particularly of use where the first geographical area is selected with reference to a location of an event. The event could 35 be, for example, a road traffic accident, a fire or other emergency or a more mundane event such as a large sporting event.

In some applications of the invention it will be advantageous for the allocation of radio units or sub-groups of radio units into the group to be made with reference to the event. Thus, an emergency such as a forest fire could lead to the combination of say fire, forestry and ambulance services 5 whilst a civil disturbance could lead to the combination of police, fire and ambulance services.

The method may be carried out by one controller of the communication system or by elements of the system operating in combination, that is to say, the "intelligence" may be distributed.

10

#### Brief Description of the Drawings

A specific embodiment of the invention will now be described, by way of example only, with reference to the drawings of which:

15 Figure 1 shows in schematic form a communication system operating in accordance with the invention;

Figure 2 shows in block diagram form a base-station controller used in the system of Fig.1; and

Figure 3 to 8 are explanatory diagrams.

20

#### Detailed Description of a Specific Embodiment

A radio communication system 1 comprises a plurality of base-sites arranged in a cellular structure each base-site having a range of coverage 25 that forms the cell.

Each base-site is connected to a system controller 2 co-located with and connected to base-site 3. The system controller 2 performs a network managing function monitoring the performance of the base-sites and 30 mobiles operating in the cells. The other base-sites will include base-site controllers for controlling the base-site under instruction from the system controller.

As is shown in Figure 2, in physical terms the controller 2 comprises a micro-computer including a processor 20, a memory 21 and an interface 22 which connects the controller to the base-site 3 and thence 35 to the other base-sites serving the other cells. The connection to the other base-sites may be achieved by radio-link or land-line links or a combination of these.

The memory 21 comprises a set of memory locations holding data and program in the form of hexadecimal numbers. Figure 3 shows the memory in greater detail and it will be seen that it has a number of subdivisions.

- 5 Subdivision 30 is allocated to hold the earlier mentioned program which governs the operation of the controller 2. Subdivision 31 is a table, the entries of which, list the direct mode configurations present in the system. Subdivision 32 is a further set of configurations termed "hot cell" configurations and subdivision 33 is a list of "hot" cells.
- 10 The subdivision 31 is shown in greater detail in Figure 4 and it can be seen that it comprises a set of entries 31a to 31d. Each entry has a service identifier, which could be police, fire, ambulance or other; a channel allocated for direct mode communication (this will be a frequency and possibly a slot on that frequency); and a group identifier.
- 15 The hot cell list is a table comprising an incident identifier and a list of cells associated with that incident (the nature of the association will be later described). The table is illustrated in Figure 5.
- 20 The hot cell configuration 32 is a table containing an incident identifier 1, an incident configuration for direct mode operation and the talk groups involved. This is shown in Figure 6.
- 25 The method of operation of the system will now be explained with reference to the flow chart of Figure 7.
- 30 Let us suppose an emergency incident occurs within cell T of the system 1. The nature of the incident is such that the police, ambulance and fire services should be able to communicate in direct mode.
- 35 The incident is reported as in step 70 to the controller 2. In step 71 the cell within which the incident is located is identified. Then the so-called hot cells are identified, these are the cells neighbouring the incident cell as well as the incident cell itself. Thus, for this case the cells S to Z are identified as hot cells. This is step 72.
- 40 A list of hot cells is assembled and stored in sub-division 33 in step 73.
- 45 In step 74, a list of direct mode configurations is then referred to for each of the groups that are to communicate in this case police, fire and ambulance. The controller 2 then establishes a super group configuration including a channel (or channels) and a super group identifier. This is a

hot cell configuration and it is stored in the hot cell configurations subdivision 32.

The hot cell configurations are then downloaded in step 75 to the hot cells S to Z where they are held in memory at the base-site controllers as

5 represented by step 80 of Figure 8. Figure 8 also shows how the method is then implemented by the base-sites. In step 81 when a mobile enters the cell served by the base-site, that is to say a "hot cell" it will establish contact. The group identifier of the mobile will be examined by the base-site in step 82.

10 Consideration is given in step 83 as to whether or not the mobile is one of the groups allocated to the super group. This is done by the group being compared with the look up table of hot cell configurations 32. If the mobile is one of the groups, that is to say, a police, fire or ambulance radio it will be downloaded with the configuration of the super group from the  
15 base-site in step 84.

If it is not a relevant group member it will be processed normally as indicated in step 85.

Thus, it will now be appreciated that as a mobile travels to an incident it will pass through neighbouring cells to the cell within which  
20 the incident is located. Upon entry of these hot cells, the mobile will be automatically loaded with an emergency direct mode configuration (or other mode configuration) enabling communication in direct mode with members of a newly defined talk group when direct mode is selected. It will be appreciated that since the configuration is downloaded during  
25 transit through a neighbouring cell the configuration will be available for immediate use when the mobile is at the location of the incident.

It will be appreciated that should the incident be located beyond the cellular coverage of the system, for example at zone F the direct mode configuration to be used could be provided as a mobile passes through  
30 neighbouring cells Z and Y which would be defined as the hot cells.

Although in the described embodiment reference is made to an incident or event, the invention is also applicable where a particular combination of groups is required in a particular area. In its broadest aspect the invention will permit different direct mode configurations to be  
35 used in different geographical areas. For example, the system could allocate different direct mode configurations for the cells shown in fig. 1. the configuration or some parameters of the configuration could be

repeated over the system. For example, the direct mode configuration of cell V of Fig. 1 could be the same as the direct mode configuration to be used in cell Z. Interference will not occur because they are separated by cell T. The configuration could be down-loaded to the radio from the base-site serving the cell or from neighbouring cell base-sites as the mobile passes through them to the cell where the configuration will be used.

5 The configuration could be dynamically changed depending on the load in the geographical area and or on the different group requirements.

Claims

1. A communication control method for use in a radio communication system providing direct mode and trunk mode operation having radio units including base-sites and mobile radios which method governing communication in a first geographical area and comprising the steps of: providing a direct mode configuration to be used by at least one of the radio units operating in the first geographical area; and downloading the configuration to the at least one of the radio units .  
10
2. A method as claimed in claim 1 comprising the steps of: downloading the configuration to at least one of the radio units present in neighbouring geographical areas; and  
15 downloading the configuration from the at least one of the radio units to at least one mobile radio such that when the mobile enters the first geographical area it has the appropriate configuration to be used.
3. A method as claimed in claim 1 or 2 comprising the step of :  
20 identifying the first geographical area where a configuration is required.
4. A method as claimed in any one of claims 1, 2 or 3 comprising the step of:  
25 identifying the neighbouring geographical areas.
5. A method as claimed in any one of the preceding claims wherein the configuration is provided for use by a group of radio units.
- 30 6. A method as claimed in claim 5 comprising the step of: allocating radio units to the group.
7. A method as claimed in claim 6 wherein the group is formed of sub-groups of radio units.

8. A method as claimed in any preceding claim including the steps of:  
selecting the first geographical area with reference to a  
location of an event.
- 5
9. A method as claimed in claim 8 wherein the allocation of radio units  
or sub-groups of radio units into the group is made with reference to the  
event.
10. 10. A method substantially as hereinbefore described with reference to  
and as illustrated by the drawings.



Application No: GB 9623486.9  
Claims searched: 1-10

Examiner: Brian Ede  
Date of search: 24 January 1997

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): H4L(LDJ, LDM, LDSX)

Int Cl (Ed.6): H04M 1/72 H04Q 7/22 7/24 7/26 7/28

Other: Online: WPI

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
X	GB 2287612 A (MOTOROLA) whole document relevant	1 at least
X	GB 2286505 A (MOTOROLA) see Figure 2	1 at least
X	GB 2285723 A (MOROROLA) see Figures 1C, 3A and 3B	1 at least
X	WO95/06395A1 (NOKIA) whole document relevant	1 at least
X	US 5117501 (GENERAL ELECTRIC CO) see Figures 1 and 2	1 at least

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.